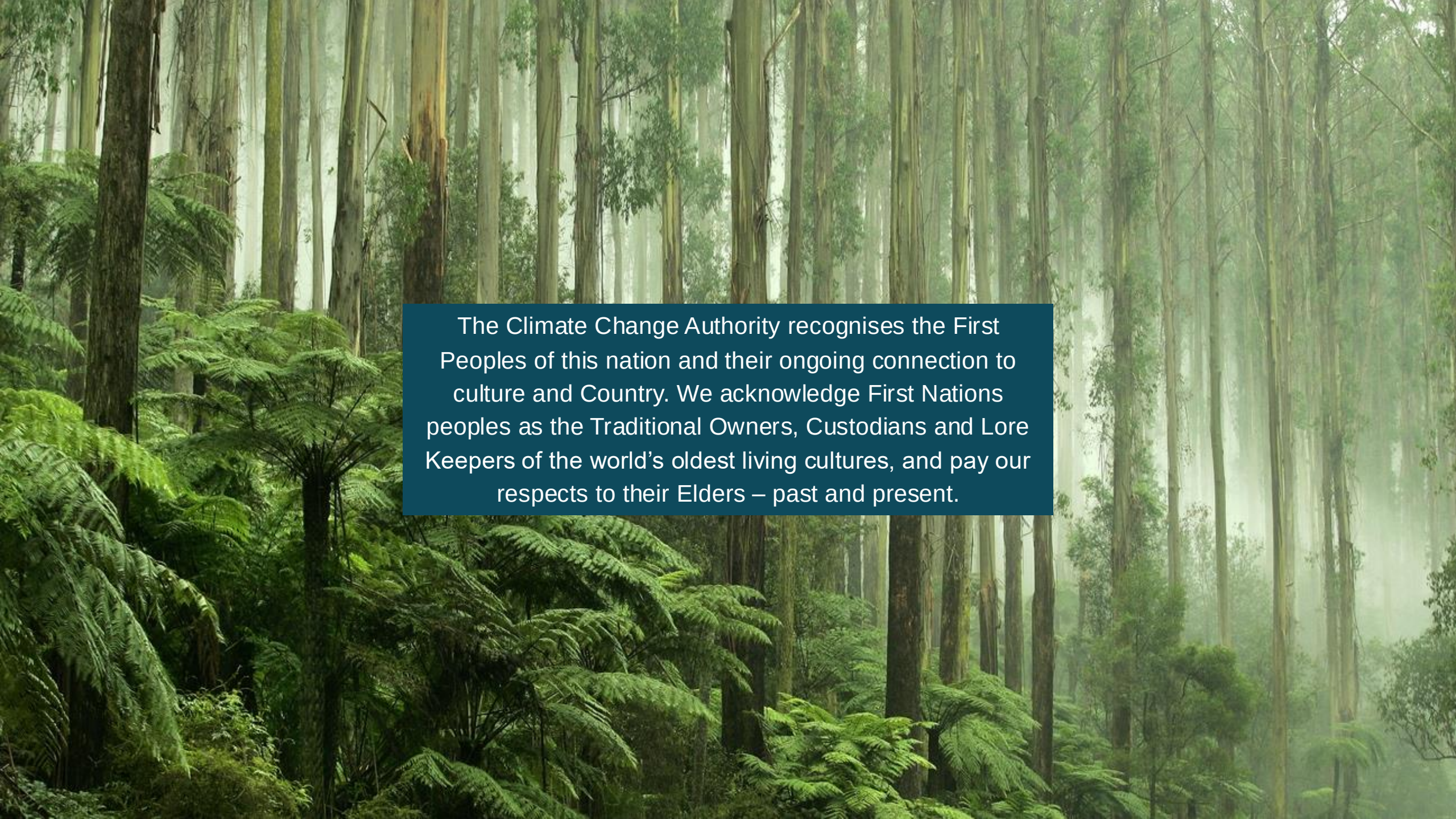
CLIMATE CHANGE AUTHORITY

# Carbon ‘Budgets’ in Climate Policy

Dr Will Howard, Lead Scientist

February 2025

Australian Government
Climate Change Authority



The Climate Change Authority recognises the First Peoples of this nation and their ongoing connection to culture and Country. We acknowledge First Nations peoples as the Traditional Owners, Custodians and Lore Keepers of the world's oldest living cultures, and pay our respects to their Elders – past and present.

# The Climate Change Authority is an independent advisory agency

The authority is an independent statutory body established under the *Climate Change Authority Act 2011* to provide expert advice to the Australian Government on climate change policy

## The authority provides independent, evidence-based advice:

- The preparation of the Annual Climate Change Statement to Parliament
- Greenhouse gas emissions reduction targets for Australia's nationally determined contributions to the Paris Agreement
- Other matters as requested by the Minister or Parliament
- Self-initiated independent research and analysis

## and reviews:

- The *Carbon Credits (Carbon Farming Initiative) Act 2011* (Australian Carbon Credit Unit Scheme)
- The *National Greenhouse and Energy Reporting Act 2007* (NGER reporting and the Safeguard Mechanism)

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# The Climate Change Authority is made up of a board and secretariat

The authority comprises up to nine members including a Chair and Australia's Chief Scientist, and a secretariat.

The authority's board and secretariat possess skills and expertise across a range of scientific, engineering and social science backgrounds.

**Climate Change Authority Chair – Mr Matt Kean**

Members:

Ms Susie Smith

Mr. John McGee

Dr Virginia Marshall

Professor Lesley Hughes

Ms. Fiona Simpson

Mr. Richard Bolt

Ms. Patty Akopiantz

Dr. Cathy Foley (Chief Scientist, *ex officio*)

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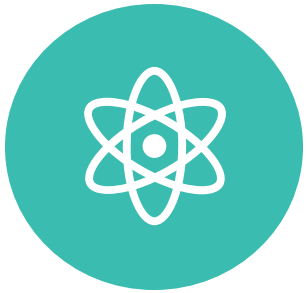
# What are our major projects in 2025?

2035 Targets Advice

Electricity System Recommendations Report



Nuclear Energy Report

2025 Annual Progress Report

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# Climate Change Authority advice on the 2035 emissions reduction targets for Australia's next Nationally Determined Contribution (NDC). Analysis across four 'pillars:'

## Pillar 1
International considerations

Alignment with the Paris Agreement. This includes consideration of the emissions budget.

International elements such as trade, foreign policy and other countries' approaches will also inform our advice.

## Pillar 2
Wellbeing

Non-economic impacts will be considered through analysis of physical and environmental impacts, regional impacts and First Nations issues.

Broad consultation is also considered here to better inform the authority's work.

## Pillar 3
Sectoral pathways

Understand sectoral decarbonisation pathways through desktop analysis.

Separate sectoral analysis will tell us how any recommended targets will be feasible.

## Pillar 4
Economic analysis

Examining the opportunities and costs for the Australian economy of different emission reduction pathways and targets, at a national, sectoral and regional level.

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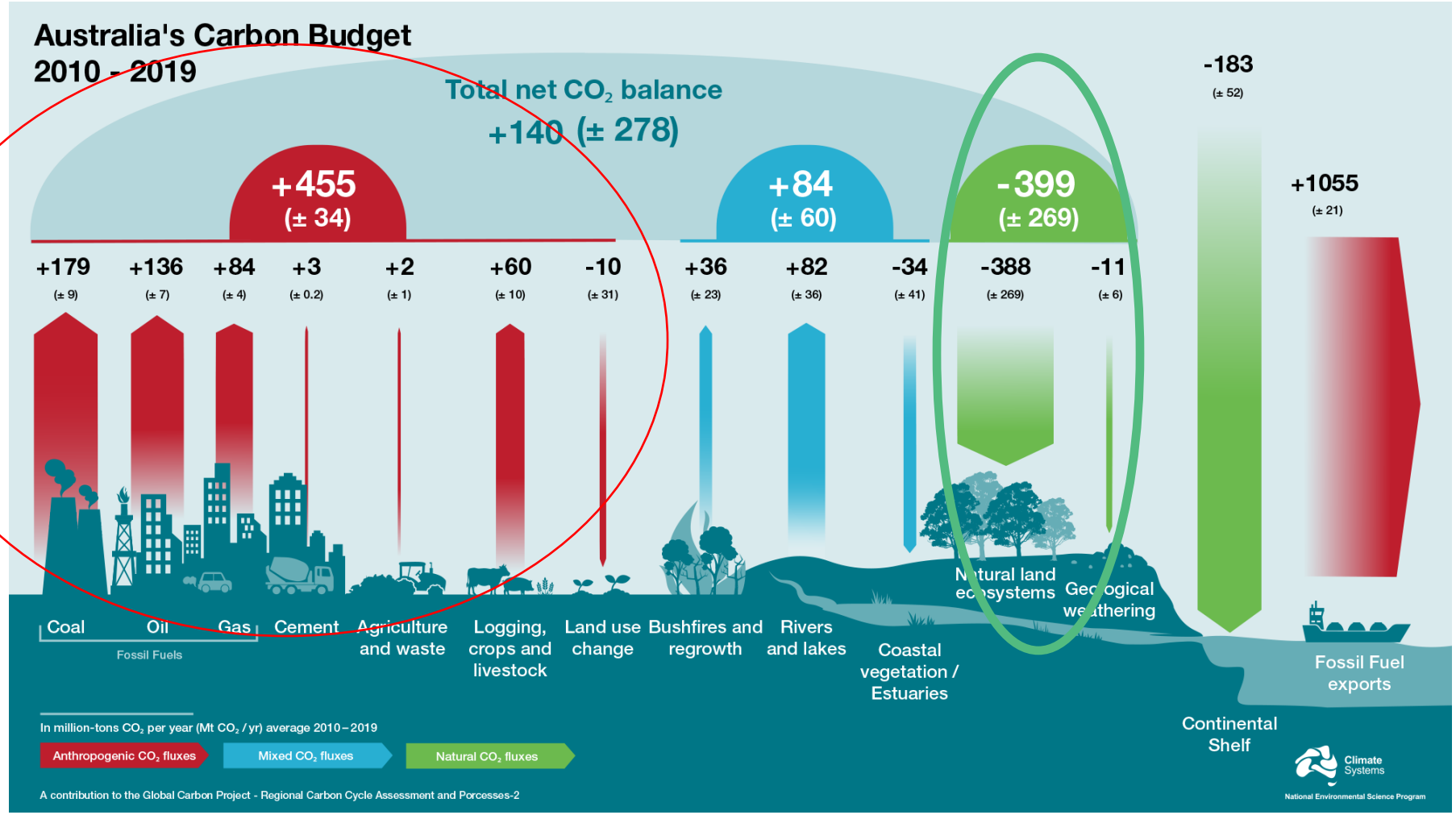
# Australia's carbon 'budget' including all components




Villalobos et al. GBC 2023

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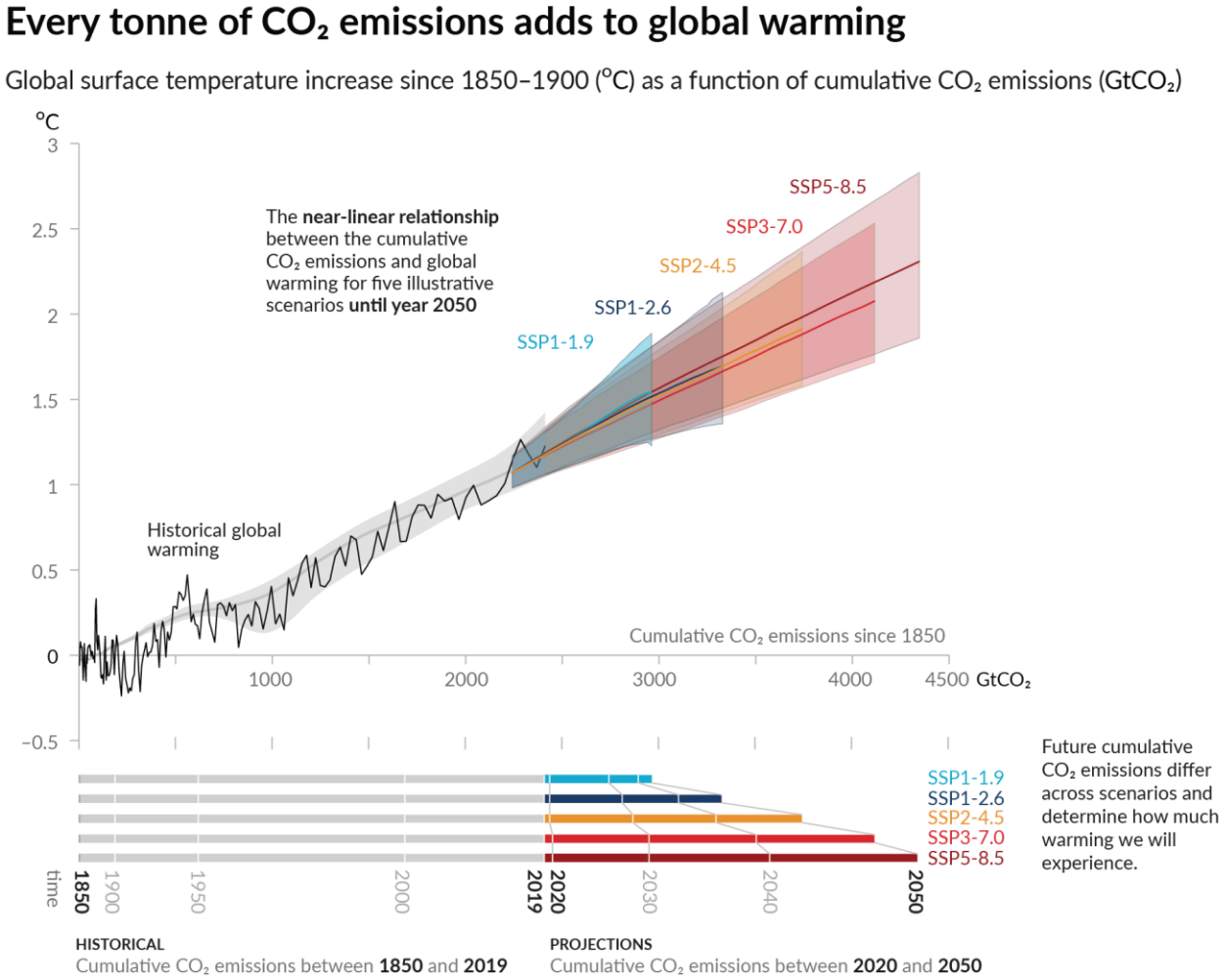
# Carbon dioxide budget: the IPCC view




Cumulative emissions vs. warming (IPCC WG I, 2022).

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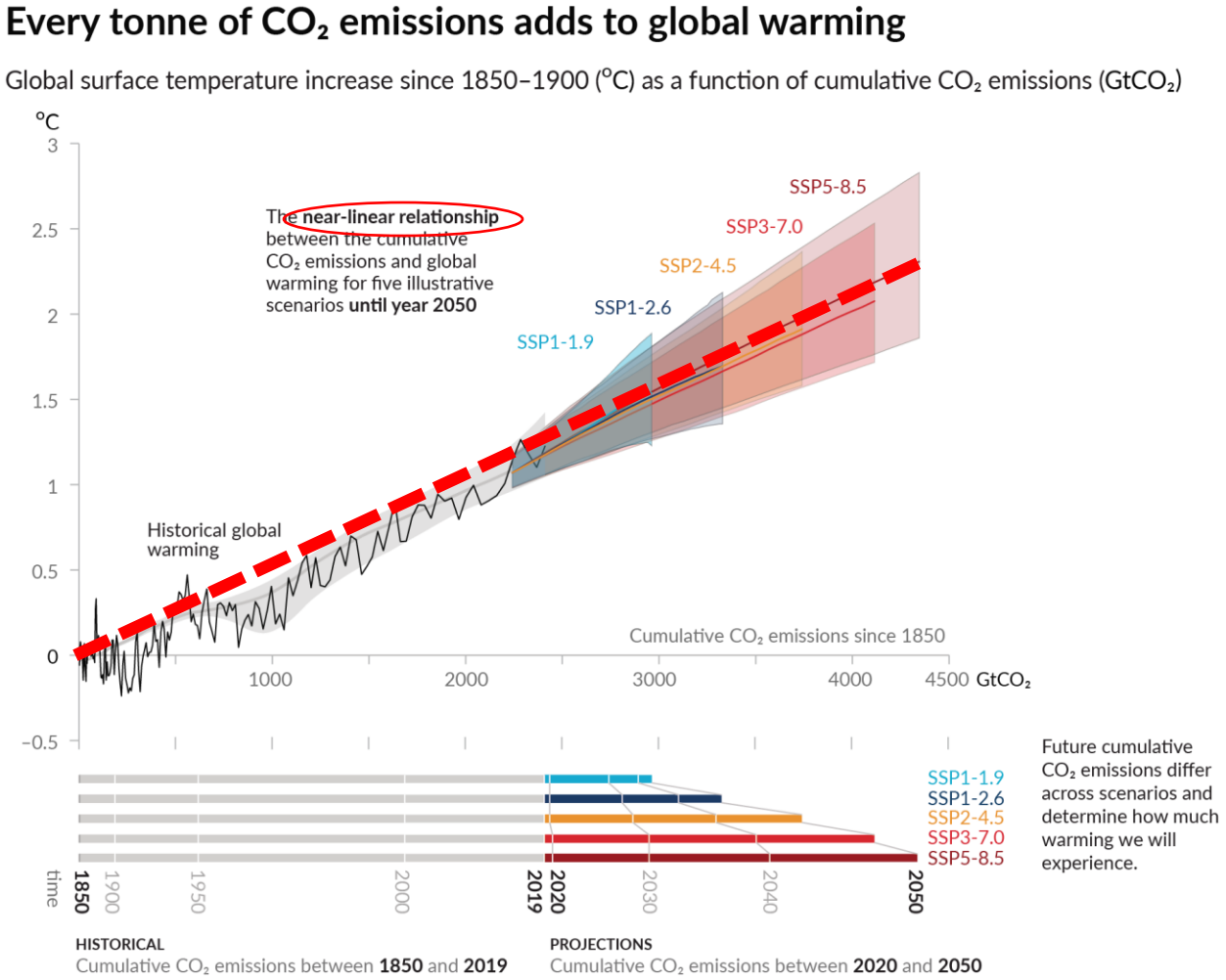


Cumulative emissions vs. warming (IPCC WG I, 2022).

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# Carbon dioxide budget: the IPCC view

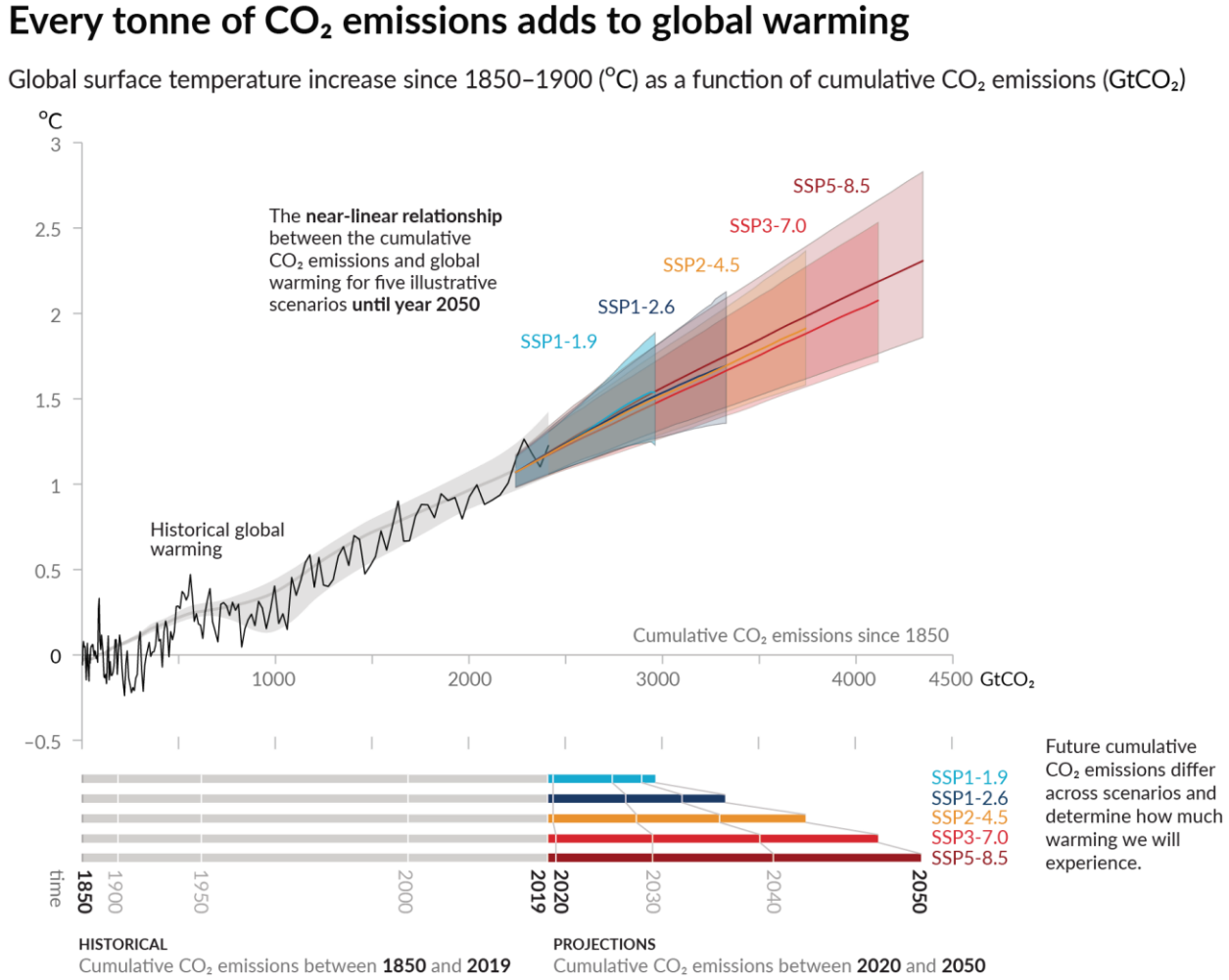
Global Carbon Project 2024: remaining carbon budget, from 2024:

1150 GtCO2 for 2°C (50 % chance)
625 GtCO2 for 1.7°C (50 % chance)
275 GtCO2 for 1.5°C (50 % chance)

Important distinctions/caveats:

this is for $CO_2$, not for all GHGs

The long atmospheric lifetime of $CO_2$ means its cumulative emissions are relevant on policy-relevant timescales.




Cumulative emissions vs. warming (IPCC WG I, 2022).

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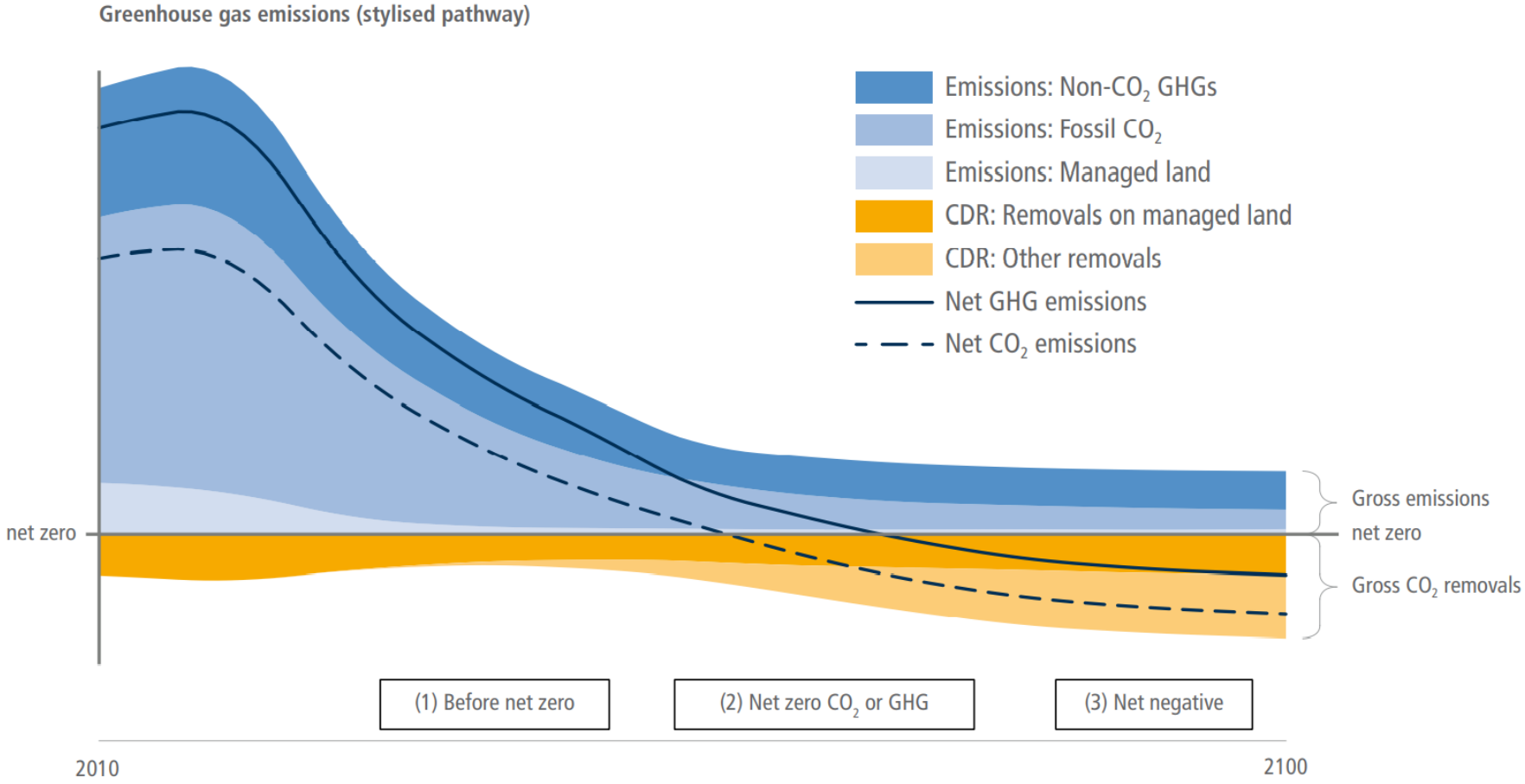
# Moving to net zero globally




Emissions reductions and removals required for net-zero pathways (IPCC WG III, 2022, Ch. 12)

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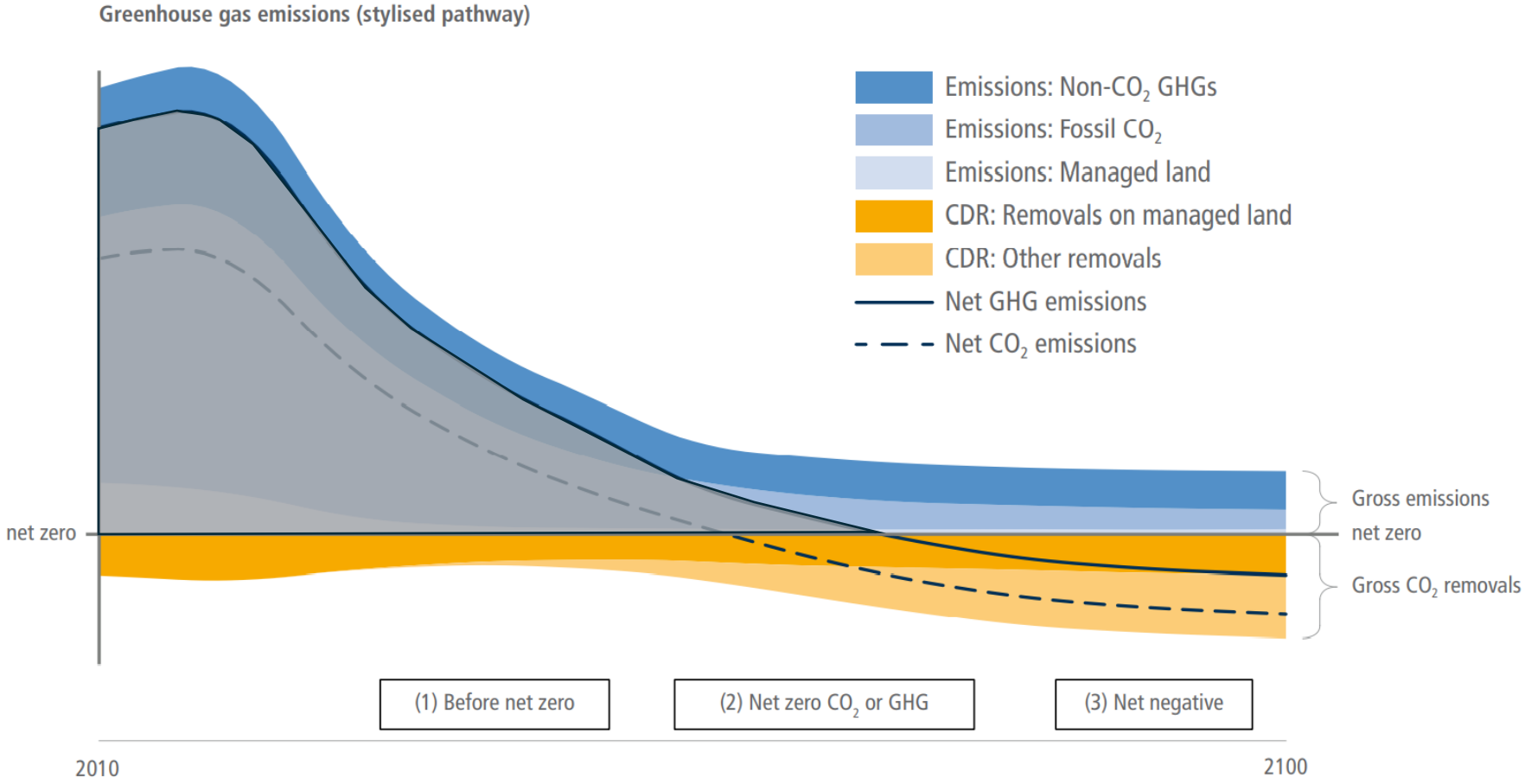


Emissions reductions and removals required for net-zero pathways (IPCC WG III, 2022, Ch. 12)

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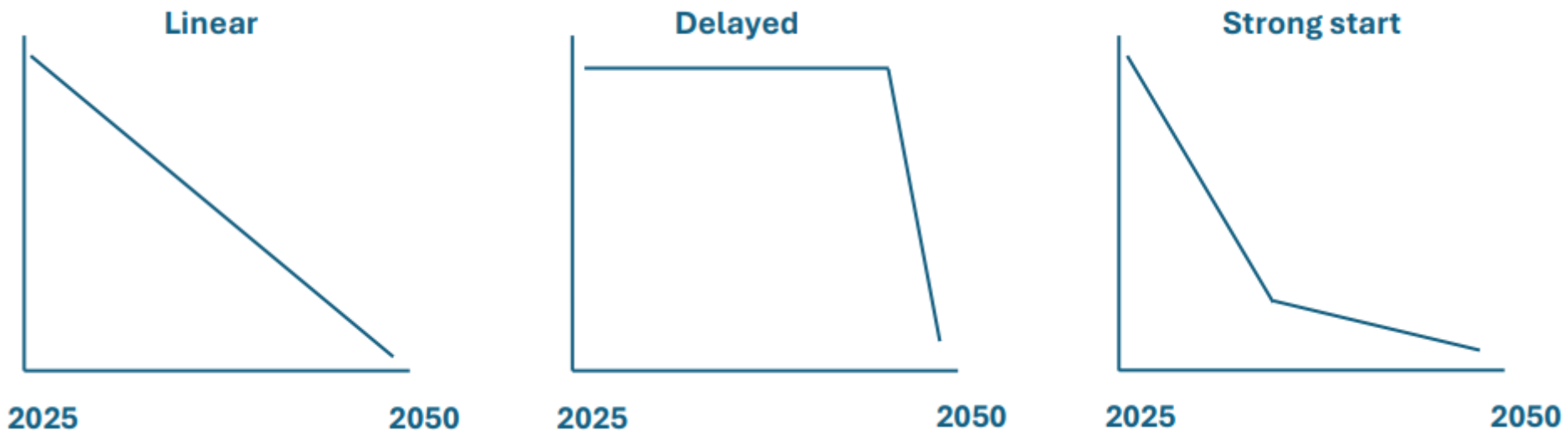
# Different ‘pathways’ to net zero can have different cumulative emissions (~ ‘budgets’)

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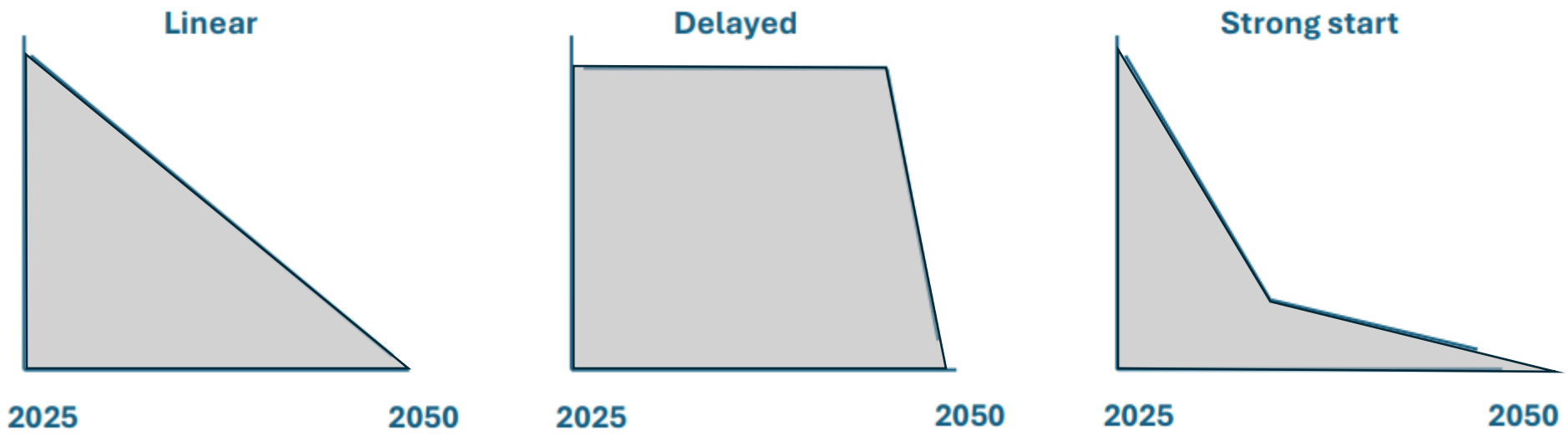


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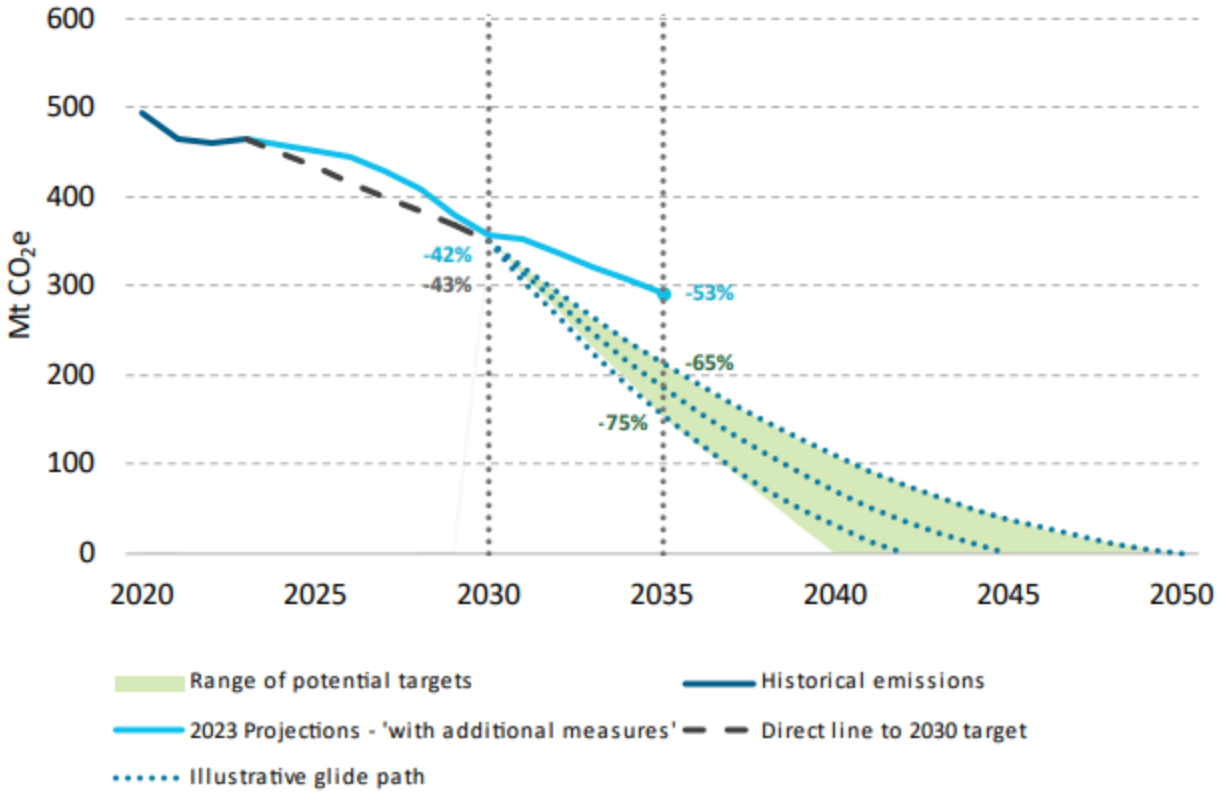
# What does a ‘glide path’ look like?




**Each of these paths can be expressed as a ‘budget’**

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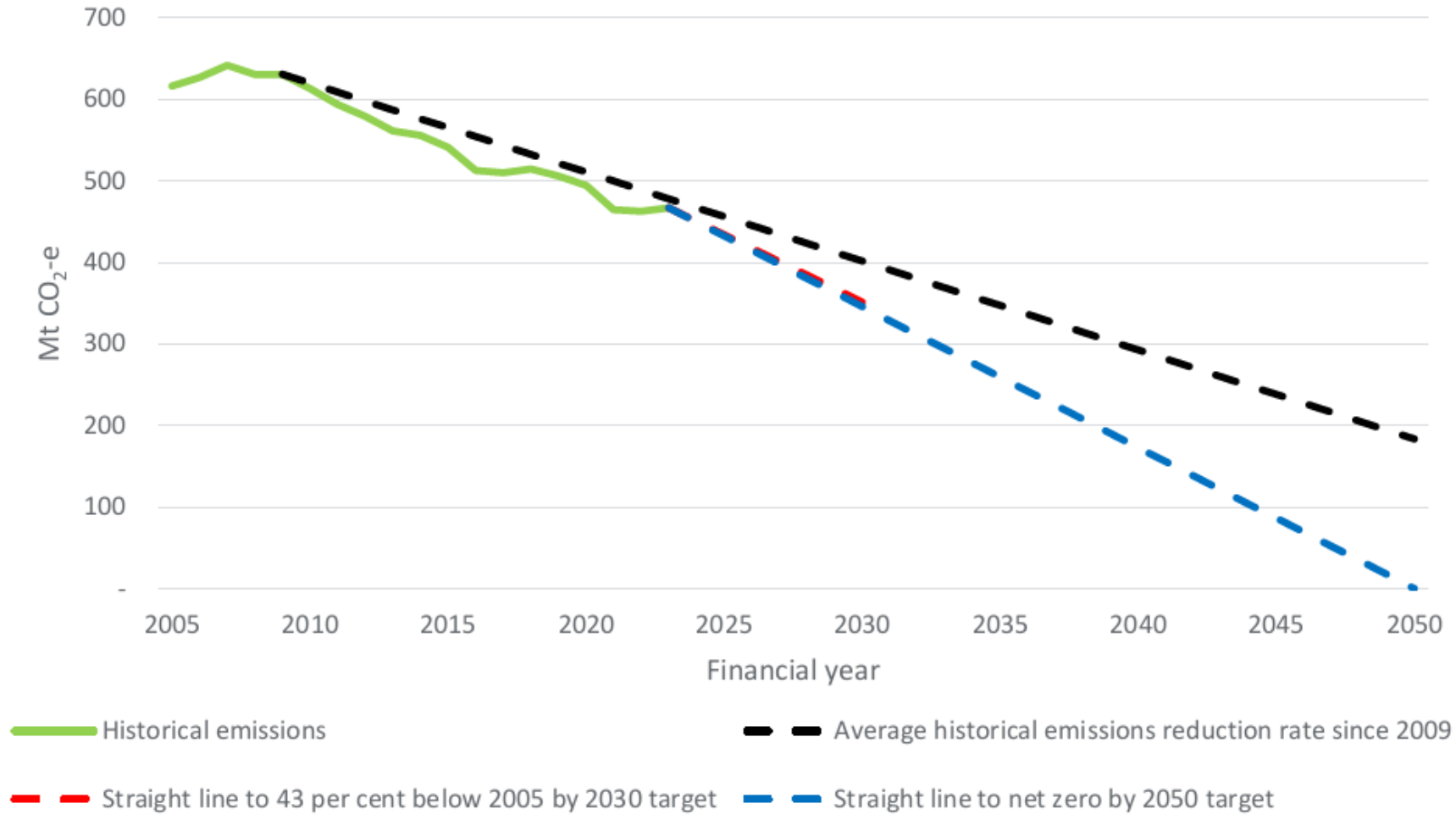
# Emissions trajectories for Australia




Climate Change Authority: Annual Progress Report 2023

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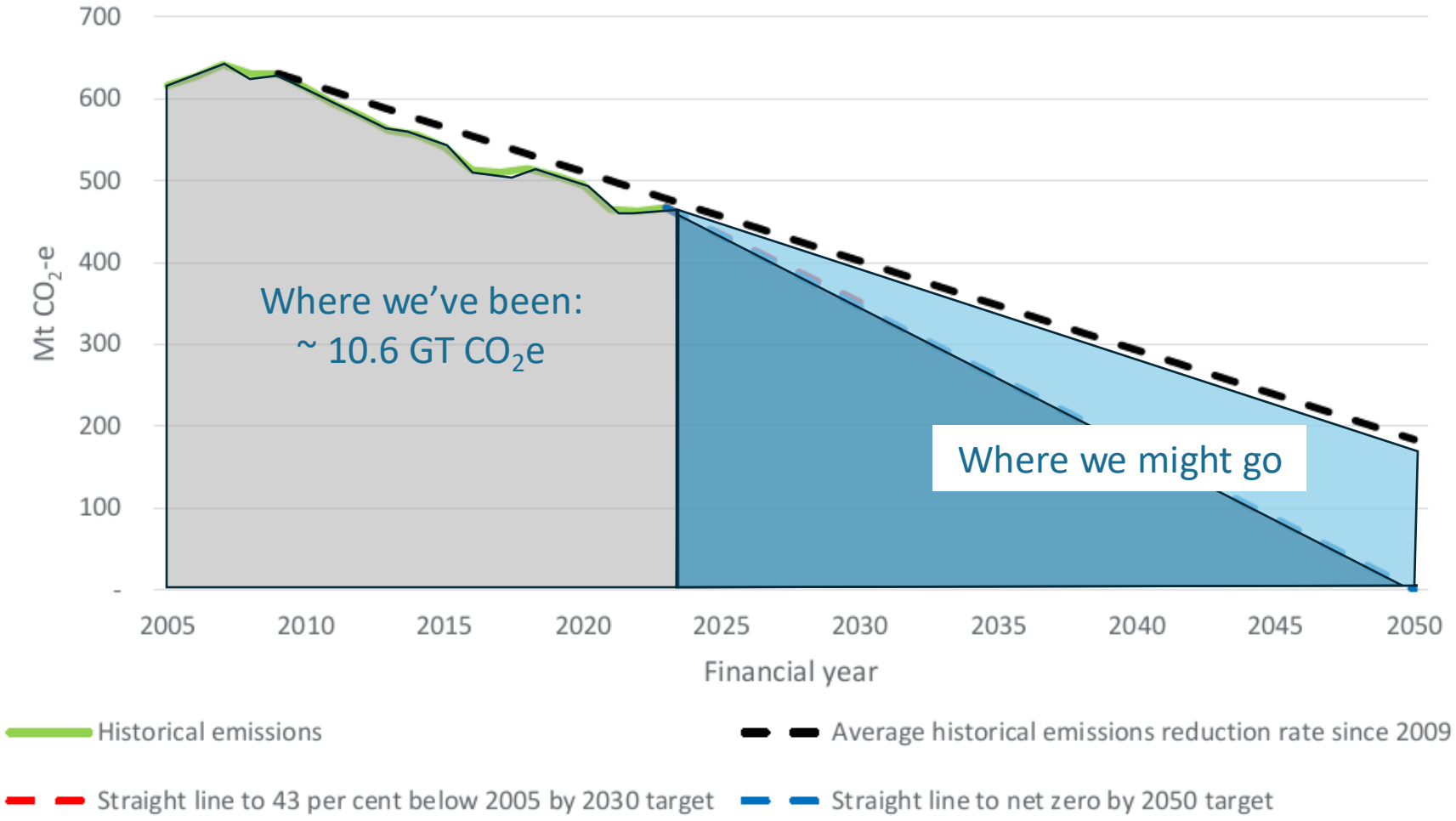
# Challenge of net zero for Australia

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Climate Change Authority: Annual Progress Report 2023

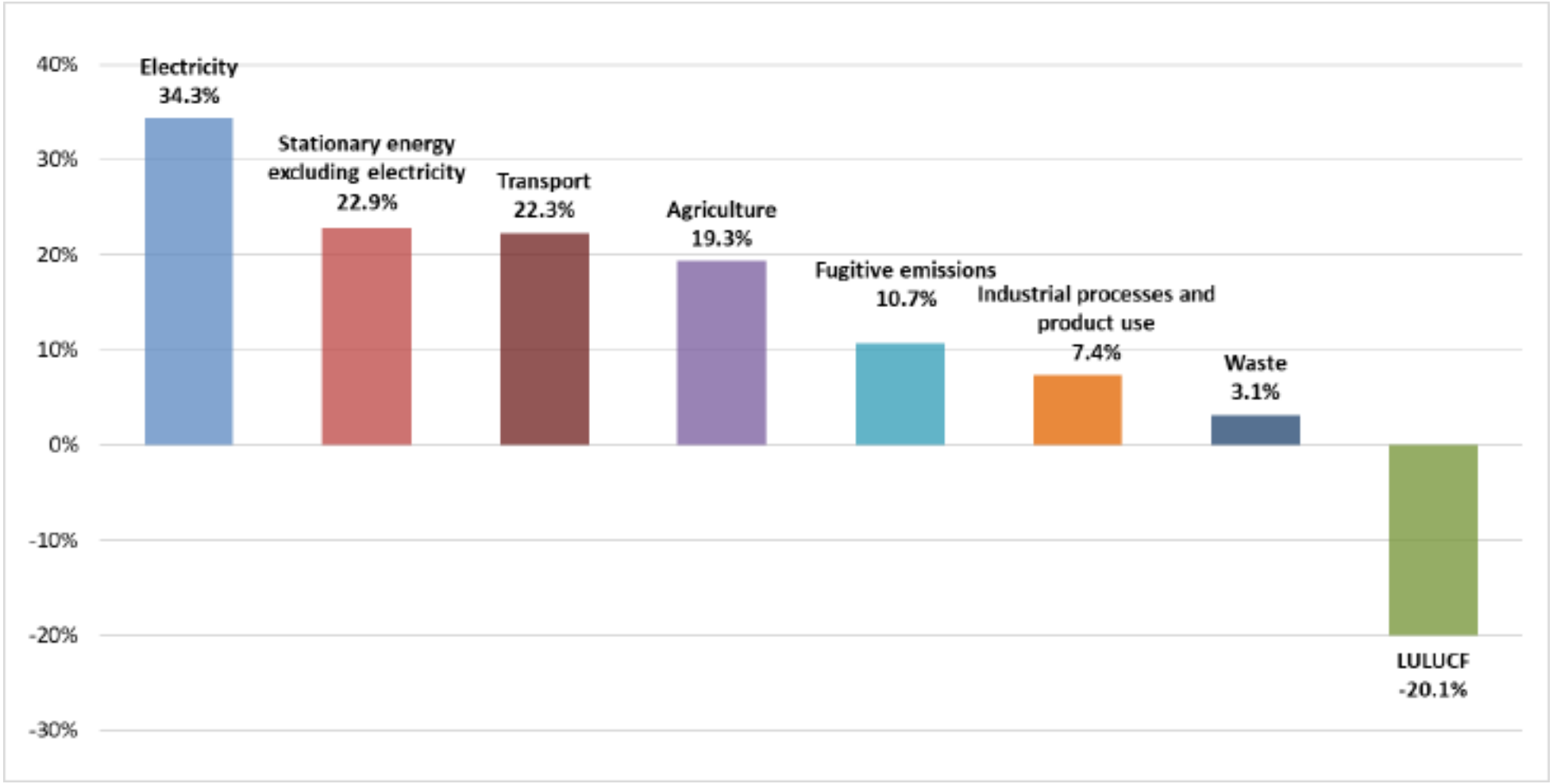




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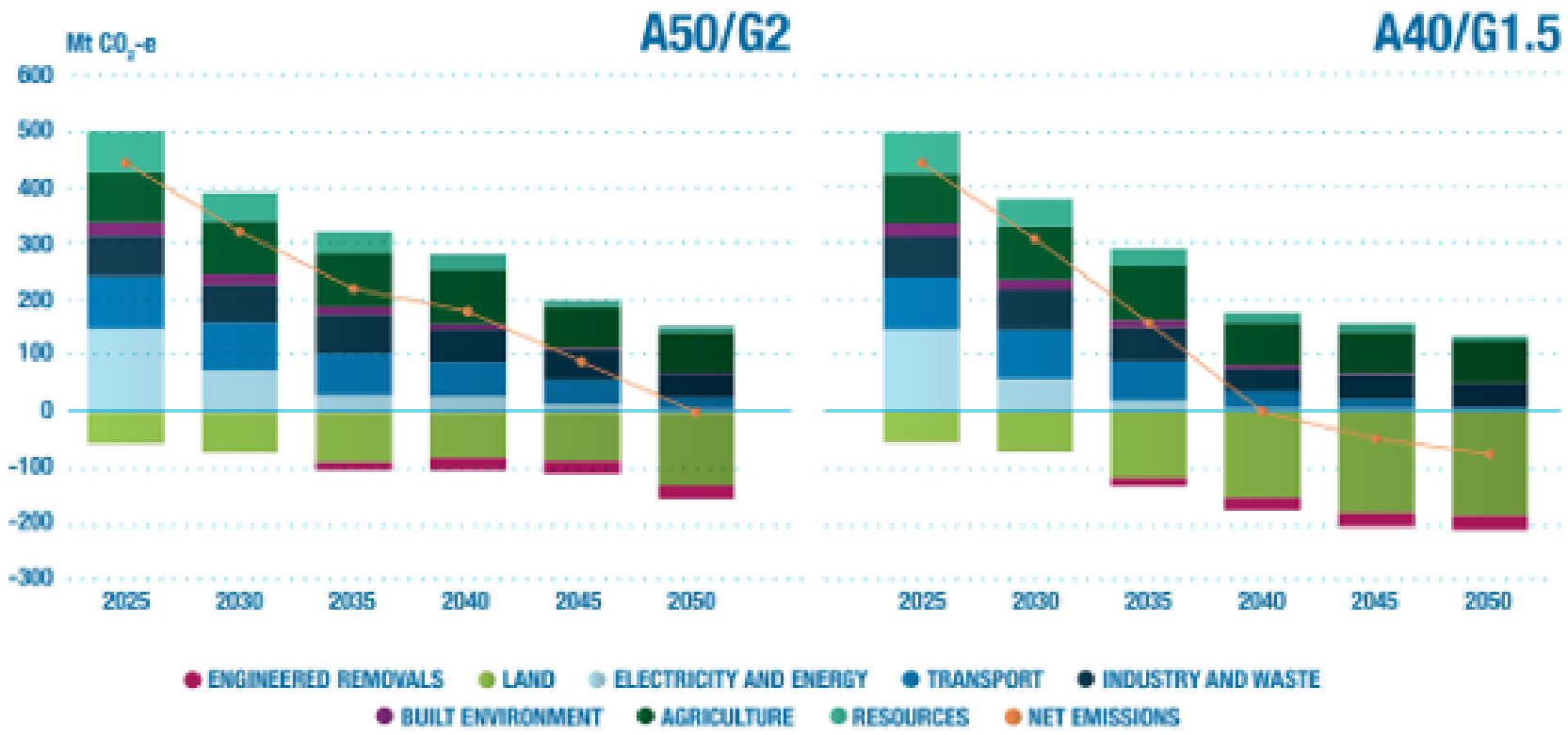
Figure NP.2: Gross emissions, removals and a net emissions trajectory, 2025 to 2050




*Source: CSIRO modelling in AusTIMES commissioned by the Climate Change Authority*

Note: This figure separates the agriculture and land sector into agriculture and land subsectors. See Figures S.1 and S.2 in the Summary section and the sector chapters for the results of the authority's ground-up analysis.

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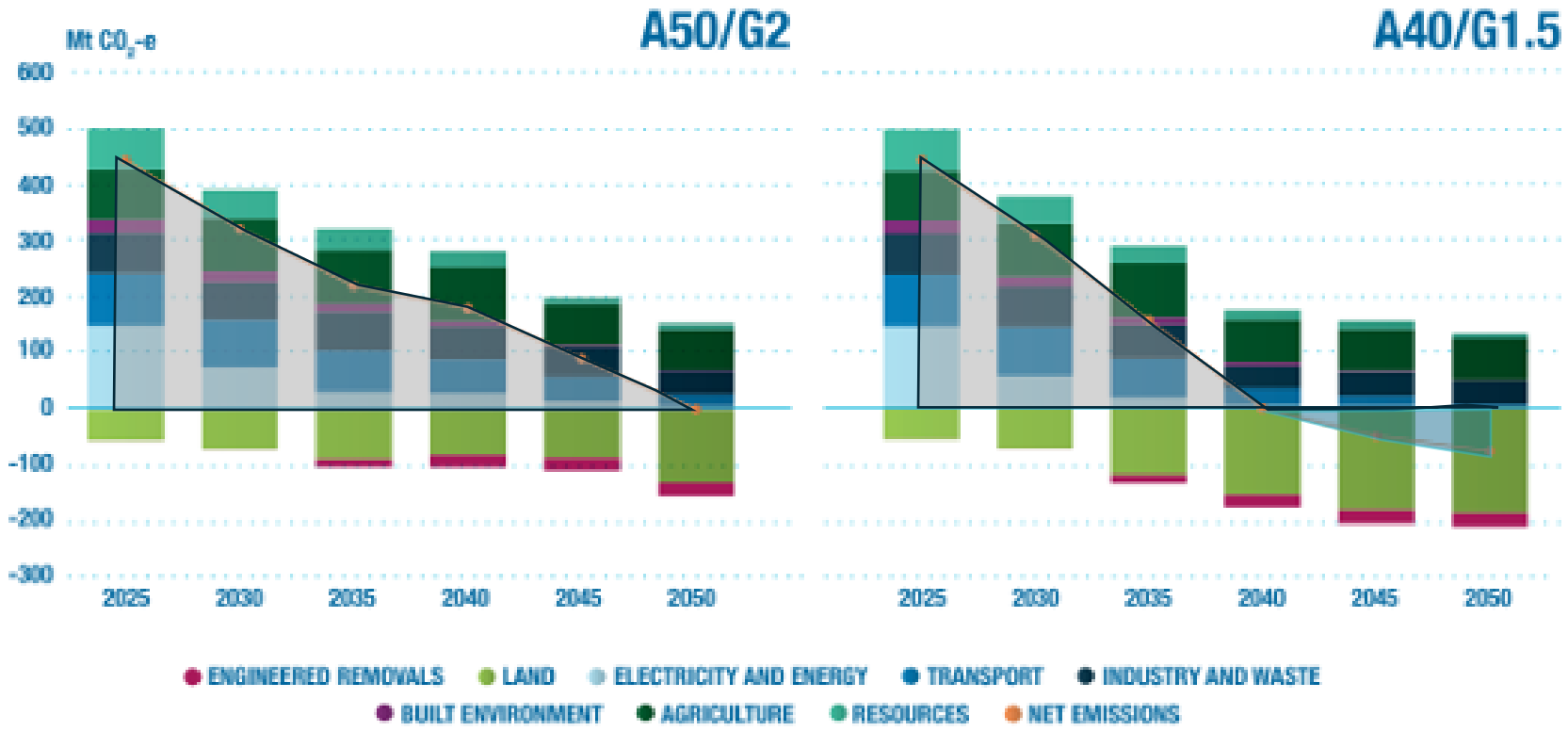


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# Challenges

- Techno-economic models are not configured to estimate climate feedbacks into decarbonisation pathways.
- The shape of the pathway matters esp. for long-time-scale processes such as ocean acidification, ocean heat uptake, ice sheet mass balance. We need to understand path-dependency.
- It remains difficult to separate some deliberate actions from natural ones (e.g. land use change versus natural land ecosystems' behaviour).
- Very difficult to consider pathways to scale, and economic viability for emerging technologies such as enhanced weathering and direct air capture.
- Emission implications of different mixes of technologies remain uncertain, especially as Scope 3 and lifecycle emissions can be challenging to estimate.
- Estimating 'residual' emissions remains uncertain.

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# Opportunities

- Many technologies that already exist; these need to be scaled
  - RD&D efforts for emerging technologies
- We have considerable low-emissions energy resources to drive domestic and global decarbonisation
  - Including carbon sequestration resources (e.g. geological storage)
  - Includes critical minerals necessary for low- and zero-emissions technologies
- We have policy ‘architecture’ to accelerate emissions reductions (e.g. Safeguard, ACCU Scheme, etc.)

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# Thank you.

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